DESCRIPTION

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DEVICES FOR NUCLEAR SPIN TOMOGRAPHY MAGNETIC RESONANCE IMAGING (MRI)

Cross-Reference to Related Application

This application claims priority to German Application No. 10108581.8, filed February 22, 2001.

Background of Invention

OK to enter JV 12-23-2003

In today's interventional nuclear spin tomography MRI, it is desirable to utilize materials of a certain elasticity, such as is used in springs, in biopsy and other automated needles, and cardiovascular or other cavity stents. Titanium based materials exhibiting low field distortion, or image artifacts, in nuclear spin tomography, are in part too brittle and have insufficient elasticity. Filigree structures imaging isn't optimal either.

Brief Summary of the Invention

The subject invention pertains to devices for use in nuclear spin tomography magnetic resonance imaging (MRI). The subject devices incorporate materials having desirable properties, such as elasticity. In a specific embodiment, the subject device can incorporatestainless steels of a cobalt-nickel chrome-based alloy. The subject invention relates to devices for nuclear spin tomography MRI, such as springs, automated needles, stents, cardiovascular stents, torsion springs, coil springs, membrances, and guide wires.

Detailed Description of the Invention

The subject invention pertains to devices for use in nuclear spin tomography magnetic resonance imaging (MRI). The subject devices incorporate materials having desirable properties, such as elasticity. In a specific embodiment, the subject device can incorporatestainless steels of a cobalt-nickel chrome-based alloy. The subject invention relates

to devices for nuclear spin tomography MRI, such as springs, automated needles, stents, cardiovascular stents, torsion springs, coil springs, membrances, and guide wires.

The first alloy on a CoNiCr base consists of 42 to 48% cobalt by weight, 19 to 25% nickel by weight, 16 to 20% chromium by weight, 2 – 6% molybdenum by weight, 2 – 6% wolfram by weight, 2.5 to 7.5% iron by weight, as well as additives of titanium and beryllium. The material can be further hardened. It is breakproof and can be utilized for highly challenged small dimensional springs, which must also be antimagnetic.

The material is highly suitable for springs utilized in measuring and display instruments of all kinds, including torsion and coil springs, membranes and other springs requiring high resistance accuracy. It is equally suitable for stents. For this application it is drawn into tiny tubes and subsequently cut into stents. Stents are metallic spring elements that are inserted into cavities in the human body, e.g., cardiovascular vessels, in order to prevent them from closing. The stents are introduced into the body with the help of catheters that are in turn guided in by guide wires. The core of the guide wire frequently consists of a long spring wire and the material cited here is ideally suited for its manufacture.

The material exhibits a high degree of corrosion resistance. Its superior cold fabrication properties in conjunction with good temperability produces an exceptionally durable, fatigue-free substance, that in tempered condition offers very attractive long-term stability values in situations with both high and low metal fatigue windows. Futhermore, the alloy can be utilized in a permanent application up to the middle temperature range, i.e., from -50°C to 350°C. The material has an elasticity modulus of 219.5 to 234.4 kN/mm^2. Due its relative permeability of $<1.005\mu$ it cannot become magnetized in the nuclear spin tomography MRI or nuclear magnetic resonance unit. The material is biocompatible and can be used for implants in the human body.

Another material consists of 39 to 41% cobalt by weight, 15 to 18% nickel by weight, 19 to 21% chromium by weight, 6.5 to 7.5% molybdenum by weight, <0.15% carbon, <1.2% silicon by weight, <0.01% beryllium by weight, <0.015% sulfur by weight, <0.015% phosphorous by weight, as well as an iron additive. The mechanical properties are similar to those of the first named materials, wherein the elasticity modulus (Youngs modulus) is at 212 kN/mm^2.

The materials are classified under the ISO 5832/7, AFNOR NF S 90-403, ASTM F1058-91 standards, where ISO 5832/7 is a material, as known in the art, having a chemical

composition of 39 to 42% (m/m) cobalt, 18.5 to 21.5% (m/m) chromium, 14 to 18% (m/m) nickel, 6.5 to 8% (m/m) molybdenum, 1 to 2.5% (m/m) manganese, up to 1% (m/m) silicon, up to 0.15% (m/m) carbon, up to 0.015% (m/m) phosphorous, up to 0.015% (m/m) sulfur, up to 0.001% (m/m) beryllium, and iron for the balance.